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# THE PLANT DISEASE REPORTER

Issued By

Division of Mycology and Disease Survey

BUREAU OF PLANT INDUSTRY

UNITED STATES DEPARTMENT OF AGRICULTURE

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The Plant Disease Reporter is issued as a service to plant pathologists throughout the United States. It contains reports, summaries, observations, and comments submitted voluntarily by qualified observers. These reports often are in the form of suggestions, queries, and opinions, frequently purely tentative, offered for consideration or discussion rather than as matters of established fact. In accepting and publishing this material the Division of Mycology and Disease Survey serves merely as an informational clearing house. It does not assume responsibility for the subject matter.

THE PLANT DISEASE REPORTER

Issued by

THE PLANT DISEASE SURVEY

DIVISION OF MYCOLOGY AND DISEASE SURVEY

Volume XXVI April 1, 1942 Number 6

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Dinitro-ortho-cresol shows promise as an eradicant spray for the control of fruit diseases, according to results with apple scab and raspberry anthracnose in Minnesota reported by E. G. Sharvelle, page 153.

## CHECK LIST REVISION

Freeman Weiss

QUERCUS -- continued.

QUERCUS GAMBELII Nutt., under Q. LOBATA.
QUERCUS GARRYANA Dougl., under Q. LOBATA.
QUERCUS GEORGIANA Curtis, under Q. COCCINEA.
QUERCUS HYPOLEUCOIDES A. Camus (Q. hypoleuca Engelm.), under Q. ARIZONICA.
QUERCUS ILLICIFOLIA Wang., under Q. VELUTINA.
QUERCUS IMBRICARIA Michx., under Q. PHELLOS.
QUERCUS LAEVIS Walt., under Q. VELUTINA.
QUERCUS LAURIFOLIA Michx., under Q. PHELLOS.
QUERCUS LOBATA Née, CALIFORNIA WHITE OAK. Tree of Growth Regions 3, 4, & 5, grown for shade & ornament in Calif. Also Q. GAMBELII Nutt. (Q. leptophylla Rydb.), ROCKY MT. WHITE OAK, of G.R.'s 9, 11, 13 & 14; Q. GARRYANA Dougl., OREGON WHITE OAK, of G.R.'s 1 & 2; Q. UNDULATA Torr., ROCKY MT. SHIN OAK, of G.R.'s 9, 11, 13, 14, 16, 17, 20; and Q. SADLERIANA Brown, SADLER OAK, of G.R. 4.

Armillaria mellea Vahl ex Fr., root rot. Oregon.
Coryneum megaspermum Syd., on twigs. Colo.
Cronartium quercuum (Berk.) Miyabe, leaf rust (II,III). Calif.
Cylindrosporium kelloggii Ell. & Ev., leaf spot. Calif.
Dothidella janus (Berk. & Curt.) Höhn., leaf spot. Oregon.
Endothia singularis (Schw.) Shear & N.E.Stevens, on branches. Colo., N.Mex.
Fomes applanatus (Pers. ex Fr.) Gill., butt rot, heart rot. Oregon.
F. everhartii (Ell. & Gall.) Schrenk, white heart rot. Calif., N.Mex.
F. igniarius (L. ex Fr.) Kickx., white mottled heart rot. N.Mex., Oregon.
Hymenochaete rubiginosa (Dicks. ex Fr.) Lév., wood rot. Wash.
Lenzites betulina L. ex Fr., wood rot. Calif.
Microsphaera alni DC. ex Wint., powdery mildew. Calif., Oregon, Wash.
M. a. var. calocladophora (Atk.) Salm., Wash.
Mycosphaerella sp., leaf spot. Oregon.
M. caespitosa Ell. & Ev., leaf spot. Calif.
M. spleniata (Cke. & Pk.) House, on fallen leaves. Colo.
Nectria coccinea Pers. ex Fr., on branches. Oregon.
N. galligena Bres., trunk canker. Oregon.
N. punicea Schm. ex Fr. (Cylindrocarpon album var. majus Wr.), on branches. Oregon.
Nummularia clypeus (Schw.) Cke., Oregon, Utah, Wash.
Phoradendron villosum Nutt., mistletoe. Calif., Oregon.
Polyporus dryophilus Berk., white pocket heart rot. Ariz., Calif., Colo., N. Mex., Oregon, Wash.
P. sulphureus Bull. ex Fr., brown cubical heart rot. Calif., Oregon.

QUERCUS -- continued.

Polyporus spp., wood rot, chiefly logs & slash, sometimes on living trees. P. adustus Willd. ex Fr., Oregon; P. cinnabarinus Jacq. ex Fr., N.Mex.; P. dichrous Fr., Wash.; P. fissus Berk., Oregon; P. glomeratus Pk., Oregon; P. hirsutus Wulf. ex Fr., N. Mex.; P. obtusus Berk., N.Mex.; P. unitus Pers., Calif., N. Mex.; P. versicolor L. ex Fr.

Poria spp., chiefly sapwood rot of logs & slash. P. andersonii (Ell. & Ev.) Neuman, Ariz., Calif., Oregon; P. contigua (Pers. ex Fr.) Cke., Oregon; P. ferruginosa Schrad. ex Fr., N.Mex., Oregon; P. mucida Fr., Oregon.

Septoria ocellata (Lév.) Sacc., on leaves. Oregon.

Stereum spp., sapwood or heart rot of logs & timber sometimes on living trees. S. complicatum Fr., Wash.; S. gausapatum Fr., Oregon; S. hirsutum Willd. ex Fr., Oregon, Wash.

Strumella coryneoidea Sacc. & Wint., trunk canker. Oregon.

Taphrina caerulescens (Desm. & Mont.) Tul., leaf blister. Calif., Colo., Wyo.

QUERCUS LYRATA Walt., under Q. MACROCARPA.

QUERCUS MACROCARPA Michx., BUR OAK. Forest tree of Growth Regions 15, 16, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30. Also Q. LYRATA Walt., OVERCUP OAK, of G.R.'s 20, 22, 25, 28, 29, 30.

Aleurodiscus oakesii (Berk. & Curt.) Cke., bark patch. Widespread.

Armillaria mellea Vahl ex Fr., root rot. Ill., Minn., Wis.

Articularia quercina (Pk.) Höhn., on leaves. Miss.

Ceratophorum uncinatum (Clint.) Sacc., on leaves. Ill., Ind., Mo.

Clitocybe tabescens (Scop. ex Fr.) Bres., root rot. Okla.

Cronartium quercuum (Berk.) Miyabe, leaf rust (II,III). Wis. to Miss., Kans. & S.Dak.

Cylindrosporium microspilum Sacc. & Wint., leaf spot. Ill.

Dothiorella phomiformis (Sacc.) Petr. & Syd., leaf spot. Conn.

Fomes spp., heart rot, butt rot, commonly in living trees. F. applanatus (Pers. ex Fr.) Gill. and F. everhartii (Ell. & Gall.) Schrenk, widespread; F. fraxinophilus Pk., N.Dak., S.Dak.; F. geotropus Cke., La.; F. ohiensis Berk., N.Dak.

Gloeosporium septorioides Sacc., leaf spot. Ill., Nebr., N.Dak.

Gnomonia veneta (Sacc. & Speg.) Kleb., anthracnose, leaf blight. Iowa, Kans., Ky., Wis.

Graphium rubrum Rumbold, wood stain. Ark., Miss.

Hydnum erinaceus Bull. ex Fr., white spongy heart rot. La.

Lentinus tigrinus Bull. ex Fr., sapwood or sometimes heart rot. La.

Marssonina martini (Sacc. & Ell.) P. Magn., leaf spot. Wis. to Miss., Kans. & Nebr.

Microsphaera alni DC. ex Wint., powdery mildew. Widespread.

Microstroma album (Desm.) Sacc., on leaves. Ill.

Mycosphaerella nigrita (Cke.) J.H.Miller, on fallen leaves. Ga., Nebr.

M. spleniata (Cke.& Pk.) House, on fallen leaves. Kans.,Nebr., Wis.

QUERCUS -- continued:

Nummularia clypeus (Schw.) Cke., on branches. N.Dak.
Phoradendron flavescens (Pursh) Nutt., mistletoe. Texas.
Phyllactinia corylea Pers. ex Karst., powdery mildew. Ill., Miss.
Phyllosticta livida Ell. & Ev., leaf spot. Wis.
P. quercus Sacc. & Speg., Ind., Wis.
Phymatotrichum omnivorum (Shear) Dug., root rot. Texas.
Physalospora glandicola (Schw.) N.E. Stevens, on twigs, ? canker.
P. quercifolia Ell. & Ev., on leaves. Nebr.
Polyporus dryadeus Fr., white root rot. Minn.
P. dryophilus Berk., white pocket heart rot. Central States to La.
P. sulphureus Bull. ex Fr., brown checked heart rot. Minn.
Polyporus spp., wood rot, chiefly of logs, sometimes heart rot of living trees. P. fissilis Berk. & Curt., La.; P. gilvus (Schw.) Fr., Nebr., N.Dak.; P. hirsutus Wulf. ex Fr., N.Dak.; P. pargamenus Fr., La.; P. versicolor L. ex Fr., N.Dak.; P. zonalis Berk., La.
Sphaerotheca lanestris Harkn., brown mildew. Ill.
Stereum frustulosum Pers. ex Fr., heart rot. N.Dak., S.Dak.
S. rameale Schw., sapwood or sometimes heart rot. La.
S. subpileatum Berk. & Curt., butt rot, white pocket heart rot. La.
Taphrina caerulescens (Desm. & Mont.) Tul., leaf blister. Iowa, Wis. Wyo.
Trametes serialis Fr., brown dry rot. Nebr.
Valsa macrocarpa Ell. & Ev., on branches. Kans.
Venturia orbicula (Schw.) Cke. & Pk., on leaves. Kans.

QUERCUS MARILANDICA Muench., under Q. NIGRA.
QUERCUS MICHAUXII Nutt., under Q. PRINUS.
(QUERCUS MONTANA Willd.): Q. PRINUS L.
QUERCUS MUHLENBERGII Engelm., under Q. PRINUS.
QUERCUS MYRTIFOLIA Willd., under Q. PHELLOS.

QUERCUS NIGRA L., WATER OAK. Forest tree of Growth Regions 17, 20, 25, 28, 29, 30; also cult. as shade tree, Zone VI. Including Q. MARILANDICA Muench., BLACKJACK OAK, of G.R.'s 16,19, 20, 22,24,25,27,28,29,30.

Actinopelte japonica Sacc., leaf spot. W.Va.
Armillaria mellea Vahl ex Fr., butt rot. La.
Clitocybe tabescens (Scop. ex Fr.) Bres., root rot. Okla.
Cronartium fusiforme Hedgc. & Long, leaf rust (II,III). N.Car. (Fusiform gall rust (O,I) on long leaf pines)
C. quercuum (Berk.) Miyabe, leaf rust (II,III). Del. to Fla., Ark. & Tenn. (Eastern gall rust (O,I) on various hard pines.)
C. strobilinum Hedgc. & Hahn, leaf rust (II,III) on Q. nigra. Fla. (Cone rust (O,I) on Pinus caribaea and P. palustris.)
Daedalea unicolor Bull. ex Fr., wood rot. G..

QUERCUS -- continued.

Dichaena strumosa Fr., branch canker. Ga., N.Car.
Echidnodes liturae (Cke.) Theiss. & Syd., leaf spot. Fla., Texas.
Endothia gyrosa (Schw.) Fr., on branches & exposed roots. N.Car. to Ky., Fla. & La.
Fomes spp., heart rot, often of living trees. F. applanatus (Pers. ex Fr.) Gill., Ind.; F. everhartii (Ell. & Gall.) Schrenk, N.J., Pa.; F. igniarius (L. ex Fr.) Kickx, Va.
Fomes spp., wood rot, usually of logs. F. calkinsii (Murr.) Sacc. & D. Sacc., Fla.; F. fomentarius (L. ex Fr.) Kickx., Va.; F. geotropus Cke., La., Miss.; F. marmoratus (Berk. & Curt.) Cke., Texas; F. robustus Karst., La.
Ganoderma lucidum (Leyss. ex Fr.) Karst., white spongy butt & heart rot. La., Miss., S.Car.
Gloeosporium septoricides Sacc. f. major Ell. & Ev., leaf spot. N.J.
Gnomonia clavulata Ell., on fallen leaves. N.J.
Godroniopsis quernea (Schw.) Diehl & Cash, on branches. Fla.
Hydnum erinaceus Bull. ex Fr., white spongy heart rot, La., Miss.
H. pulcherrimum Berk. & Curt., sapwood rot. Ark., La.
Hypoderma illicinum DeNot., on leaves. Ala., Fla., Ga., Texas.
Hypoxylon atropunctatum (Schw. ex Fr.) Cke., wood rot, trunk canker. Ga., Okla., Pa.
Lentinus tigrinus Bull. ex Fr., sapwood or sometimes heart rot. La., Miss.
Leptothyrium dryinum Sacc., leaf spot. Miss., Texas.
Marssonina martini (Sacc. & Ell.) P. Magn., leaf spot. Ala.
Microsphaera alni DC. ex Wint., powdery mildew. N.J. to Ala., La. & Ill.
M. a. var. calocladophora (Atk.) Salm. Ala., Fla., S.Car.
M. a. var. extensa (Cke. & Pk.) Salm. Ohio, S.Car.
Monochaetia desmazierii Sacc., leaf spot. Ark., N.Car., Tenn.
Morenoella quercina (Ell. & Mart.) Theiss., leaf blotch. N.Car.
Mycosphaerella aquatica (Cke.) J.H.Miller, on leaves. Ga., S.Car.
Nectria cinnabarina Tode ex Fr., on twigs. Ala., Ga., Miss.
Nummularia clypeus (Schw.) Cke., on branches. Ga.
Phoma dendritica Thüm., on leaves. S.Car.
Phoradendron flavescens (Pursh) Nutt., mistletoe. N.Car., Texas.
Phyllactinia corylea Pers. ex Karst., powdery mildew. Ala., Ga., Ohio, S.Car.
Phyllosticta spp., leaf spot. P. livida Ell. & Ev., Fla.; P. ludoviciana Ell. & Mart.; and P. marginalis Ell. & Ev., La.
Physalospora glandicola (Schw.) N.E. Stevens, twig canker. Ill.
P. obtusa (Schw.) Cke., on branches. Ala.
Pleurotus ostreatus Jacq. ex Fr., sapwood or sometimes heart rot. La., Miss.
Polyporus dryadeus Fr., root & butt rot. Fla., Okla., Texas.
P. dryophilus Berk., white pocket heart rot. Mo., Okla., Texas.
P. fissilis Berk. & Curt., butt rot, heart rot. Ark., La., Miss.
P. ludovicianus (Pat.) Sacc. & Trott., white pocket heart rot. S. Car. to Ala., La. & Texas.

QUERCUS -- continued.

Polyporus spp., wood rot chiefly of logs, sometimes heart rot of living trees. P. frondosus Dicks. ex Fr., La.; P. gilvus (Schw.) Fr., Ind., La.; P. graveolens (Schw.) Fr., Ala.; P. hirsutus Wulf. ex Fr., Ind.; P. hispidus Bull. ex Fr., Ark., La., Miss.; P. obtusus Berk., N.Car.; P. pargamenus Fr., La., Texas; P. sanguineus L. ex Fr., Fla., Texas; P. sector Ehr. ex Fr., Ark., La.; P. spraguei Berk., Ind., La.; P. sulphureus Bull. ex Fr., Conn., La.; P. unitus Pers., Ill.; P. versicolor L. ex Fr., Texas; P. zonalis Berk., Ark., La.

Poria spp., sapwood rot, sometimes sprout butt rot. P. andersonii Ell. & Ev., Texas; P. contigua (Pers. ex Fr.) Cke., Ind.; P. flavomarginata (Murr.) Sacc. & Trott., La., S.Car.; P. floridana (Murr.) Sacc. & Trott., S.Car.; P. spiculosa Campbell & Davidson, N.Car.

Pseudovalsa lanciformis (Fr.) Ces. & DeNot., on branches. Ga.

Septobasidium spp., felt patch. Numerous spp. reported, especially on Q. nigra, as S. burtii Lloyd, Ga., S.Car.; S. castaneum Burt, Fla., La.; S. mariani Brès., N.Car.; S. pseudopedicellatum Burt, N.Car.; S. sinuosum Couch, La., S.Car.

Sphaerognomonia polystigma (Ell. & Ev.) Thompson & J.H.Miller, on leaves. Ga.

Stereum gausapatum Fr. and S. subpileatum Berk. & Curt., butt rot, white pocket heart rot. Ark., La. S. fasciatum Schw. and S. fuscum Schrad. ex Quél., Texas.

Strumella coryneoidea Sacc. & Wint., trunk canker. Ill.

Taphrina caerulescens (Desm. & Mont.) Tul., leaf blister. Va. to Fla., La. & Okla.

Trabutia quercina (Fr. & Rud.) Sacc. & Roum., tar spot. Ala., Miss.

Trametes subnivosa Murr., heart rot. La.

QUERCUS PALUSTRIS Muench., PIN OAK. Forest tree of Growth Regions 21,22, 23, 24, 25, 27, 29; often grown as a street tree, Zone IV. Including Q. ELLIPSOIDALIS E. J. Hill, NORTHERN PIN OAK, of G.R.'s 21,22,23,24; cult. Zone IV.

Armillaria mellea Vahl ex Fr., root rot. Ill.

Cronartium quercuum (Berk.) Miyabe, leaf rust (II,III). Md., Ga., Wis.

Cylindrosporium microspilum Sacc. & Wint., leaf spot. Ill.

Cytospora chrysosperma Pers. ex Fr., twig canker. N.J.

Endothia gyrosa (Schw.) Fr., on branches & exposed roots. Ga., Ind.

Fomes applanatus (Pers. ex Fr.) Gill. and F. everhartii (Ell. & Gall.) Schrenk., heart rot. Widespread.

Ganoderma curtisii (Berk.) Murr., butt rot. Md.

Gloeosporium septorioides Sacc., leaf spot. Wis.

Gnomonia veneta (Sacc. & Speg.) Kleb., leaf blight. Conn., N.J.

Hymenochaete rubiginosa Lév., wood rot. Ind.

Leptothyrium dryinum Sacc., leaf spot. Va., Wis.

Microsphaera alni DC. ex Wint., powdery mildew. Va. to Ala. & Wis.
M. a. var. extensa (Cke. & Pk.) Salm., Ill., Va.

QUERCUS -- continued.

Monochaetia desmazierii Sacc., leaf spot. Kans.
Morenoella quercina (Ell. & Mart.) Theiss., leaf blotch. Ohio.
Phoradendron flavescens (Pursh) Nutt., mistletoe. Ind.
Phyllactinia corylea Pers. ex Karst., powdery mildew. Ill., Ind.
Phymatotrichum omnivorum (Shear) Dug., root rot. Texas.
Physalospora glandicola (Schw.) N.E. Stevens, twig blight, canker.
Polyporus dryophilus Berk., heart rot. Mo.
Polyporus spp., wood rot, chiefly logs & slash, or sometimes on living trees. P. cinnabarinus Jacq. ex Fr., La.; P. sanguineus L. ex Fr., La.; P. sector Ehr. ex Fr., La.; P. spraguei Berk., Ind., Mass.; P. versicolor L. ex Fr., Ind.
Pseudovalsa longipes (Tul.) Sacc., twig canker. Ill., Mich.
Septobasidium spp., felt patch. S. burtii Lloyd, N.Car.; S. cokeri Couch, N.Car.; S. curtisii (Berk. & Desm.) Boed. & Stein., widespread.
Sphaerognomonia polystigma (Ell. & Ev.) Thompson & J.H.Miller, on leaves. Ga.
Stereum subpileatum Berk. & Curt., butt & heart rot. Ark., Mo.
Strumella coryneoidea Sacc. & Wint., trunk canker. Conn.
Taphrina caerulescens (Desm. & Mont.) Tul., leaf blister. Widespread.
Chlorosis, -- iron or other mineral deficiency, usually in calcareous soil. Widespread.

QUERCUS PHELLOS L., WILLOW OAK. Large tree of Growth Regions 20, 25, 27, 28, 29, 30; extensively planted for shade, Zone V. Including Q. CINEREA Michx., BLUEJACK OAK, of G.R.'s 22,23, 24,25,27,28; Q. IMBRICARIA Michx., SHINGLE OAK, of G.R.'s 16,20,25,28,29,30; and Q. LAURIFOLIA Michx., LAUREL OAK, of G.R.'s 20,28,29,30, cult. Zone VII; and Q. MYRTIFOLIA Willd., MYRTLE OAK, of G.R.'s 17,29,30.

Armillaria mellea Vahl ex Fr., root rot. Fla., La.
Asterina spp., black stromata, mostly superficial, on leaves, chiefly of Q. laurifolia. Fla. (A number of spp. have been described and later were transferred to other genera as Calothyrium, Dictyothyrium, Microthyriella etc.).
Calonectria erubescens (Desm.) Sacc., on leaves of Q. laurifolia. Fla.
Clitocybe tabescens (Scop. ex Fr.) Bres., root rot. Fla.
Cronartium fusiforme Hedgc. & Long, leaf rust (II,III). On Q. cinerea, Fla. (Fusiform rust (O,I) on long leaf pines.)
C. quercuum (Berk.) Miyabe, leaf rust (II,III). Md. to Fla. & Tenn. (Eastern gall rust (O,I) on various pines.)
C. strobilinum Hedgc. & Hahn, leaf rust (II) on Q. laurifolia, Fla. (Cone rust (O,I) on long leaf pines.)
Endothia gyrosa (Schw.) Fr., on branches. Ga., Ind., N.Car., S.Car.
Fomes applanatus (Pers.ex Fr.) Gill., butt rot, heart rot. Occasional.
F. everhartii (Ell. & Gall.) Schrenk and F. igniarius (L. ex Fr.) Kickx, heart rot. Widespread.

QUERCUS -- continued.

Ganoderma curtisii (Berk.) Murr., butt rot. Va.
G. lucidum (Leyss. ex Fr.) Karst., wound rot, heart rot. La., Miss.
Gloeosporium septorioides Sacc., leaf spot. Ill., Mo., N.J., Ohio.
Godroniopsis quernea (Schw.) Diehl & Cash, on branches. N.Car.
Hydnum erinaceus Bull. ex Fr., white spongy rot. La., Miss., N.Car.
Irenina manca (Ell. & Ev.) F.L.Stevens, black mildew. Miss.
Lentinus tigrinus Bull. ex Fr., sapwood or sometimes heart rot. La., Miss.
Lenzites betulina L. ex Fr., wood rot. Md.
Leptostroma querci Tehon, leaf spot. Ill.
Leptothyrium dryinum Sacc., leaf spot. Kans., N.Car. S.Car.
Marssonina martini (Sacc. & Ell.) P. Magn., leaf spot. Md.
Melasmia quercuum Atk., on leaves. Ala.
Microsphaera alni DC. ex Wint., powdery mildew. Md. to Fla. & Ill.
M. a.var. calocladophora (Atk.) Salm., Ala., Fla., S.Car.
M. a. var. extensa (Cke. & Pk.) Salm., Fla., Mo.
Microstroma album (Desm.) Sacc., on leaves. Mo.
Monochaetia desmazierii Sacc., leaf spot. Fla.
Morenoella quercina (Ell. & Mart.) Theiss., leaf blotch. Fla., Ga., N.Car.
Phoradendron flavescens (Pursh) Nutt., mistletoe. Texas.
Phyllactinia corylea Pers. ex Karst., powdery mildew. Ala.
Phyllosticta vesicatoria Thüm., on insect galls. S.Car.
P. neuroterigallicola Tehon, Ill.
Phymatotrichum omnivorum (Shear) Dug., root rot. Texas.
Polyporus dryophilus Berk., white pocket heart rot. La., Mo., Texas.
P. fissilis Berk., butt rot, white pocket heart rot. Ark., La., Miss.
P. ludovicianus (Pat.) Sacc. & Trott., heart rot. Gulf States.
Polyporus spp., wood rot, sometimes of living trees. P. gilvus (Schw.) Fr., La.; P. hirsutus Wulf. ex Fr., Texas; P. hispidus Bull. ex Fr., La., N.Y., N.Car.; P. sulphureus Bull. ex Fr., La.; P. versicolor L. ex Fr., Texas.
Poria cocos (Schw. ex Fr.) Wolf, root rot. Fla.
P. floridana (Murr.) Sacc. & Trott., Ark., Fla., S.Car.; P. spiculosa Campbell & Davidson, trunk canker, heart rot. Del., N.Car., Va.
Pseudovalsa longipes (Tul.) Sacc. (Coryneum kunzei Cda.), twig canker. Iowa.
Septobasidium spp., felt patch. S. alni Torrend, N.Car.; S. apiculatum Couch, Ark., N.Car.; S. burtii Lloyd, N.Car.; S. castaneum Burt, S.Car.; S. cokeri Couch, N.Car., Tenn.; S. curtisii (Berk. & Desm.) Boed. & Stein., Ark.
Septoria neglecta Earle, leaf spot. Ala.
S. serpentaria Ell. & Mart., leaf spot of Q. laurifolia. Fla.
Sphaerognomonia polystigma (Ell. & Ev.) Thompson & J.H.Miller, on leaves of Q. cinerea. Ga.
Stereum spp., heart rot of living trees, also general wood rot. S. fasciatum Schw., Texas; S. frustulosum Pers. ex Fr., Ind.; S. subpileatum Berk. & Curt., Ark., Miss.

QUERCUS -- continued.

Taphrina caerulescens (Desm. & Mont.) Tul., leaf blister. Va. to Fla. & Miss.
Trabutia erythrospora (Berk. & Curt.) Cke. and T. quercina (Fr. & Rud.) Sacc. & Roum., tar spot. Fla., Miss., Texas.
Venturia asterinoides Ell. & Mart. and V. cupulata Ell. & Mart., on leaves of Q. laurifolia. Fla.
Leprosis (scaly bark), -- cause unknown. On Q. laurifolia, Fla.

QUERCUS PRINUS L. (Q. montana Willd.), CHESTNUT OAK. Forest tree of Growth Regions 20,22,24,25,26,27,28,29,30. Including Q. MICHAUXII Nutt. (Q. prinus L. according to some authorities), SWAMP CHESTNUT OAK (basket oak), of G.R.'s 20, 25,28,29,30; Q. MÜHLENBERGII Engelm., CHINQUAPIN OAK of G.R.'s 11,16,20,21,22,23,24,25,27,28,29,30; and Q. PRINOIDES Willd., DWARF CHINQUAPIN OAK, of G.R.'s 21,22,23,24,25,27, 28,29,30.

Actinopelte japonica Sacc., leaf spot. N.J., W.Va.
Clitocybe tabescens (Scop. ex Fr.) Bres., root rot. Okla.
Coryneum pustulatum Pk. (=C. kunzei Cda.?), on twigs. Md.
Cronartium quercuum (Berk.) Miyabe, leaf rust (II,III). Ga., Kans., Md., W.Va.
Cytospora sp., dieback. N.J.
Daedalea quercina L. ex Fr., brown checked heart rot. Widespread.
Dichaena strumosa Fr., branch canker. W. Va.
Diplodia longispora Cke. & Ell., twig blight, sometimes general blight. Conn. to N.Car. & Ill. (The same or a similar disease has been ascribed to Dothiorella quercina (Cke. & Pk.) Sacc., the conidial stage of Physalospora glandicola (Schw.) N.E.Stevens, and also to Sphaeropsis malorum Pk., conidial stage of P. obtusa (Schw.) Cke.)
Dothiorella phomiformis (Sacc.) Petr. & Syd., leaf spot. Kans., Md., N.Y., W.Va.
Endothia gyrosa (Schw.) Fr., on branches. Ind.
E. parasitica (Murr.) P.J. and H.W. And., twig blight. Md.
Fomes annosus (Fr.), wood rot. Pa.
F. everhartii (Ell. & Gall.) Schrenk, white spongy heart rot. N.Car.
F. igniarius (L. ex Fr.) Kickx, heart rot. Va.
Gloeosporium septorioides Sacc., leaf spot. Miss.
Gnomonia veneta (Sacc. & Speg.) Kleb., leaf blight. Conn., N.J., W.Va., Wis.
Hydnum ochraceum Pers. ex Fr., wood rot. Ala., Ind.
Leptothyrium castaneae (Spreng.) Sacc., var. quercus C. Massal., leaf spot. Va.
Marssonina martini (Sacc. & Ell.) P. Magn., leaf spot. Pa. to Miss., Kans. and Wis.
Microsphaera alni DC. ex Wint., powdery mildew. Widespread.
Monochaetia desmazierii Sacc., leaf spot. Fla., N.Car., Tenn.
Morenoella quercina (Ell. & Hart.) Theiss., leaf blotch. Fla., Ga.

QUERCUS -- continued.

Mycosphaerella maculiformis (Pers. ex Fr.) Schroet., on fallen leaves. Widespread. The conidial stage, Phyllosticta maculiformis Sacc., appears on aging leaves in autumn.
M. punctiformis (Pers. ex Fr.) Schroet. and M. spleniata (Cke. & Pk.) House, on fallen leaves. Ga., N.Y.
Nectria galligena Bres., trunk canker. Conn.
Phomopsis quercinum (Sacc.) Höhn., twig canker. Va. (Conidial stage of Diaporthe leiphaemia var. raveneliana ?)
Phyllosticta quercus-prini Ell. & Ev., on leaves. West Va. (See also Mycosphaerella.)
Physalospora glandicola (Schw.) N.E.Stevens (Dothiorella quercina (Cke. & Ell.) Sacc.), branch canker. Ill.
Phytophthora cinnamomi Rands, seedling blight. Md.
Polyporus dryadeus Pers. ex Fr., root rot. Md., Texas.
P. dryophilus Berk., white pocket heart rot. Pa. to N.Car. & Texas.
P. hispidus Bull. ex Fr., trunk canker, heart rot. Conn., Va.
P. spraguei Berk., heart rot. Ind.
Polyporus spp., wood rot, chiefly of logs, sometimes of living trees. P. frondosus Dicks. ex Fr., N.Y.; P. gilvus (Schw.) Fr., N.Y.; P. hirsutus Wulf. ex Fr., widespread; P. hispidus Bull. ex Fr., N.Y.
Pseudovalsa longipes (Tul.) Sacc. (Coryneum kunzei Cda.), twig canker. N.J., Pa.
P. sigmoidea (Cke. & Ell.) Sacc., on twigs. W.Va.
Sphaerognomonia polystigma (Ell. & Ev.) Thompson & J.H.Miller, on leaves. Ga.
Sphaerotheca lanestris Harkn., brown mildew. Miss.
Stereum subpileatum Berk. & Curt., white pocket heart rot. Va.
Taphrina caerulescens (Desm. & Mont.) Tul., leaf blister. Ga.
Venturia orbicula (Schw.) Cke. & Pk., on leaves. N.Y. to Ohio & Va.

QUERCUS ROBUR L., ENGLISH OAK. Large tree of European region, cult. in many hort. forms, Zone IV. Including a few records on other exotic oaks, as Q. SUBER L., CORK OAK, sometimes cult. in Calif.

Colpoma quercina (Pers. ex Fr.) Wallr., branch canker. Pa.
Cytospora chrysosperma Pers. ex Fr., twig canker. N.J., R.I.
Daedalea quercina L. ex Fr., brown checked heart rot. N.Y.
Heterodera marioni (Cornu) Goodey, root knot. Calif. On Q. suber.
Marssonina martini (Sacc. & Ell.) P. Magn., leaf spot. Ind., Va.
Microsphaera alni DC. ex Wint., powdery mildew. Conn., Ill., Ind., N.Y.
Nummularia clypeus (Schw.) Cke., on branches. Md.
Physalospora glandicola (Schw.) N.E.Stevens (Dothiorella quercina (Cke. & Ell.) Sacc.) branch canker. Md., Ohio.

QUERCUS SADLERIANA Brown, under Q. LOBATA.
QUERCUS SHUMARDII Buckl., under Q. FALCATA.

QUERCUS -- continued.

QUERCUS SINUATA Walt., under Q. ARIZONICA.
QUERCUS STELLATA Wangh., under Q. ALBA.
QUERCUS SUBER L., under Q. ROBUR.
QUERCUS TEXANA Buckl., under Q. FALCATA.
QUERCUS TOMENTELLA Engelm., under Q. CHRYSOLEPIS.
QUERCUS UNDULATA Torr., under Q. LOBATA.

QUERCUS VELUTINA Lam., BLACK OAK. Forest tree of Growth Regions 20, 22,23,24,25,26,27,28,29,30. Including Q. LAEVIS Walt., TURKEY OAK, of G.R.'s 29 & 30; and Q. ILLICIFOLIA Wangh., SCRUB OAK, of G.R.'s 22,25,26,27,28.

Actinopelte japonica Sacc., leaf spot. N.J.
Armillaria mellea Vahl ex Fr., root rot. Widespread.
Articularia quercina (Pk.) Höhn., on leaves. Ill., Miss.
Bulgaria inquinans Pers. ex Fr., on branches. Ala., Conn., N.Y., Va.
Clitocybe tabescens (Scop. ex Fr.) Bres., root rot. Fla.
Cronartium quercuum (Berk.) Miyabe, leaf rust (II,III). Conn. to Fla., Miss. & Minn.
Cytospora pallida Ell. & Ev., on branches. N.J.
Daedalea quercina L. ex Fr., brown checked heart rot. General.
Dichaena quercina Pers. ex Fr. and D. strumosa Fr., twig canker. N.J., Va.
Endothia gyrosa (Schw.) Fr., on branches & exposed roots. N.Car. to Ala., Ark. & Ind.
Fomes applanatus (Pers. ex Fr.) Gill., F. calkinsii (Murr.) Sacc. & D. Sacc. and F. lobatus (Schw.) Cke., sprout butt rot, heart rot. Occasional.
F. everhartii (Ell. & Gall.) Schrenk and F. igniarius (L. ex Fr.) Kickx, heart rot. Widespread.
Ganoderma curtisii (Berk.) Murr. and G. lucidum (Leyss. ex Fr.) Karst., sprout butt & heart rot. Pa. to Ga. & Tenn.
Gloeosporium septorioides Sacc., leaf spot. Mich., Wis.
Gnomonia veneta (Sacc. & Speg.) Kleb., leaf blight. Conn., N.J.
Godroniopsis quernea (Schw.) Diehl & Cash, on branches. N.J.
Hydnum erinaceus Bull. ex Fr., heart rot. Va. to Ga. & Tenn.
Hypoxylon atropunctatum (Schw. ex Fr.) Cke., wood rot. Ga., Ill., Va.
Leptosphaeria dryophila(Cke. & Höhn.) Sacc., on leaves. N.Car.
Leptothyrium dryinum Sacc., leaf spot. N.Car.
Marssonina martini (Sacc. & Ell.) P. Magn., leaf spot. Kans., Ind., Me., Va.
M. quercus (Pk.) P. Magn., leaf spot (of Q. illicifolia). N.Y.
Microsphaera alni DC. ex Wint., powdery mildew. Widespread.
Monochaetia desmazierii Sacc., leaf spot. Mass., N.Car., Tenn., Fla.
Morenoella quercina (Ell. & Mart.) Theiss., leaf blotch. Ga., N.Car.
Mycosphaerella catesbeyi (Cke.) J.H.Miller, on leaves. Ga., S.Car.
Myxosporium stellatum Dearn., on twigs. N.Y.
Nectria galligena Bres., trunk canker. W.Va.

QUERCUS -- continued.

Nummularia clypeus (Schw.) Cke., on branches. N.Y., Va.
Phoradendron flavescens (Pursh) Nutt., mistletoe. S.E. & Gulf States.
Phyllactinia corylea Pers. ex Karst., powdery mildew. Occasional.
Physalospora glandicola (Schw.) N.E. Stevens, on branches. Ill.
P. obtusa (Schw.) Cke., N.Car.
Polyporus dryadeus Pers. ex Fr., root & butt rot. N.Y. to Md., Ark., Texas.
Polyporus spp., white pocket heart rot, typically of living trees. P. berkeleyi Fr., Pa., Va.; P. croceus Pers. ex Fr., Ark., Mo., Va.; P. dryophilus Berk., Pa. to N.Car. & Texas; P. graveolens (Schw.) Fr., Ga., Ohio; P. hispidus Bull. ex Fr., N.Y., Va.; P. obtusus Berk., Va. to S.Car.; P. spraguei Berk., Pa. to N.Car. & Ind.; P. sulphureus Bull. ex Fr., widespread.
Polyporus spp., wood rot chiefly of logs, sometimes sapwood or heart rot of living trees. P. adustus Willd. ex Fr., N.Y., P. caesius Schrad. ex Fr. , Pa., N.Car.; P. cinnabarinus Jacq. ex Fr., widespread; P. epileucus Fr., N.Y.; P. frondosus Dicks. ex Fr., Pa., N.Car.; P. gilvus (Schw.) Fr., N.Y.; P. hirsutus Wulf. ex Fr., N.Y.; P. poculum (Schw.) Berk. & Curt., Mo., Pa., Va.; P. rutilans Pers. ex Fr., N.Y.; P. semisupinus Berk. & Curt., Mass.; P. versicolor L. ex Fr., widespread.
Pseudovalsa longipes (Tul.) Sacc. (Coryneum kunzei Cda.) twig canker. Ark., Iowa, R.I.
P. sigmoidea (Cke. & Ell.) Sacc., on branches. Ga., N.J.
Septobasidium cokeri Couch, felt patch. N.J.
Septoria dryina Cke., leaf spot. Kans.
S. querceti Thüm., S.Car.
Sphaerognomonia polystigma (Ell. & Ev.) Thompson & J.H. Miller, on leaves. Ga.
Sphaeropsis linearis Pk., on branches. N.Y.
Stereum gausapatum Fr., S. subpileatum Berk. & Curt. and S. frustulosum Pers. ex Fr., sprout butt rot, white pocket heart rot. Widespread.
Strumella coryneoidea Sacc. & Wint., trunk canker. N.E. States.
Taphrina caerulescens (Desm. & Mont.) Tul., leaf blister. Widespread.
Venturia asterinoides Ell. & Mart., on leaves. Ga.

QUERCUS VIRGINIANA Mill., LIVE OAK. Large evergreen tree of Growth Regions 11,16,17,20,25,29,30,31; frequently planted for shade, Zone VII. Several geographic and ecological vars., some of which are shrubs, are recognized.

Aleurodiscus acerinus (Pers.) Höhn. & Litsch., bark patch. Texas.
Ascochyta quercuum (Cke.) Sacc., on leaves. Miss.
Botryosphaeria quercuum (Schw. ex Fr.) Sacc., on branches. Ga.
Cercospora polytricha Cke., on leaves. Ga., S.Car.
Coryneum sp., twig blight. Texas.
Cronartium quercuum (Berk.) Miyabe, leaf rust (II,III). Va. to Fla. and Texas. (Eastern gall rust, O,I on various hard pines.)

QUERCUS -- continued.

C. strobilinum Hedgc. & Hahn, leaf rust (II,III), Fla., Ga., Miss. (Cone rust; O,I on Pinus caribaea and P. palustris.)
Cuscuta exaltata Engelm.,dodder (on seedlings). Texas.
Daedalea ambigua Berk., wood rot. Ga., La.
Dothidella janus (Berk. & Curt.) Höhn., on leaves. Fla., Texas.
Endothia gyrosa (Schw.) Fr., on branches. Fla., Ga., Miss.
Fomes spp., heart rot, often of living trees. F. calkinsii (Murr.) Sacc. & D. Sacc., Fla., N.Car.; F. igniarius (L. ex Fr.) Kickx., Fla.; F. marmoratus (Berk. & Curt.) Cke., Fla.
Ganoderma curtisii (Berk.) Murr. and G. lucidum (Leyss. ex Fr.) Karst., white spongy heart rot. Fla., Texas.
Godroniopsis quernea (Schw.) Diehl & Cash, on branches. Ala., Fla.
Hymenochaete rubiginosa (Dicks. ex Fr.) Lév., wood rot.
Lentinus lecomtei Schw., sapwood rot. Fla.
Microsphaera alni DC. ex Wint., powdery mildew. Fla., Texas.
Monochaetia desmazierii Sacc., leaf spot. Fla., Tenn., Texas.
M. taphrinicola (Ell. & Ev.) Sacc., La.
Morenoella quercina (Ell. & Mart.) Theiss., leaf blotch. S.Car. to Fla. & La.
Mycosphaerella aquatica (Cke.) J.H.Miller, on leaves. Ga.
M. caespitosa Ell. & Ev., on leaves. Texas.
Passalora melioloides Tr. & Earle, on leaves. Fla., S.Car.
Phomopsis glandicola (Lév.) Grove (? P. quercina (Sacc.) Höhn), on acorns. Fla.
Phoradendron flavescens (Pursh) Nutt., mistletoe. Texas.
Phyllosticta quercus-ilicis Sacc., leaf spot. Miss.
P. virens Ell. & Langl., La., Miss.
Polyporus dryophilus Berk., white pocket heart rot. Texas.
P. sulphureus Bull. ex Fr., brown checked heart rot. Fla., S.Car., Texas.
Polyporus spp., sapwood or sometimes heart rot. P. gilvus (Schw.) Fr., Fla., Texas; P. ludovicianus (Pat.) Sacc. & Trott., La.; P. rhipidium Berk., La.; P. supinus Sw. ex Fr., Ala., Fla., La.; P. unitus Pers., Fla., S.Car.
Pseudovalsa sigmoidea (Cke. & Ell.) Sacc., on branches. Texas.
Stagonospora virens Ell. & Mart., on leaves. Fla.
Stereum fasciatum Schw. and S. subpileatum Berk. & Curt., white pocket rot. Fla.
Taphrina caerulescens (Desm. & Mont.) Tul., leaf blister. N.Car. to Fla. & Texas.
Trabutia erythrospora (Berk. & Curt.) Theiss. & Syd., tar spot. Texas.
T. quercina (Fr. & Rud.) Sacc. & Roum., Fla., Miss. S.Car.

QUERCUS WISLIZENII A.DC., under Q. AGRIFOLIA.

(DIVISION OF MYCOLOGY AND DISEASE SURVEY).

# WESTERN X-DISEASE OF PEACH IN OREGON

S. M. Zeller, J. R. Kienholz, and C. E. Owens

It is the purpose to report here our general surveys of western X-disease in Oregon during the seasons of 1940 and 1941, and to present indications of spread of the disease.

In Oregon this disease was first recognized in an orchard in Wasco County. It was suspected that one branch of peach from this orchard seen in the fall of 1939 might be affected with the disease described by Stoddard in Connecticut the year previous. At the time most affected trees in this orchard were without leaves, however, and the situation was also clouded by the isolation of Verticillium alboatrum from 2 trees, and wood-rotting fungi from others. The latter, at least, were undoubtedly secondary invaders. During 1940 this orchard was under observation, at intervals from March 20 until after typical symptoms appeared.

Observations during the season indicated that leaf symptoms suitable for diagnostic purposes were present on diseased trees about 6 to 8 weeks previous to harvest or 70 to 75 days after the trees were in full bloom. About this time, Dr. H. Earl Thomas of the University of California saw an infected peach tree near Mosier, Wasco County. He believed the symptoms were very similar to, if not identical with, those described for "leaf-casting yellows" in California (4), which is believed to be the same as the yellow-red virosis or X-disease of peach and the buckskin disease of sweet cherries (1). In rapid succession, several orchards in Wasco County were found to show more or less infection of the disease. Many orchards, however, were evidently without the disease.

Certain individual clumps and trees of the chokecherry (Prunus virginiana var. demissa) in Wasco County were found in the summer of 1940 to have red leaves similar to those described for X-disease of chokecherry in eastern States.

It was now realized that the disease had been in Wasco County at least as early as 1935, but the casual observations of 1938-1939 indicated it was not extremely serious during those years.

A 20-acre tract of peaches was mapped on July 8, 1940, to show individual trees infected and the approximate location of diseased limbs in each tree. Another map of the same orchard was prepared from a survey of the infected trees in July 1941. An idea of the serious nature of the disease and its rapid spread may be gained from the above statements and the results of these two surveys as summarized in the following table.

It will be seen that increase in infection is rapid under eastern Oregon conditions, and that in this case the disease involved 33.7% of the trees. In certain orchards in other parts of Oregon up to 90% of the trees have been found infected with the X-disease.

The field symptoms of the disease on peach in Wasco County are typical of those in other counties of eastern Oregon, with two exceptions: First, as Zeller and Evans (5) have mentioned, another set of symptoms referred to as marginal leaf spot of Rochester peach appears farther east in the Columbia Basin of Oregon; this set of symptoms may prove not to be related to the western X-disease. A second set of leaf symptoms including

Results of surveys of western X-disease on peach trees in an Oregon orchard, seasons of 1940 and 1941.

| Year | Total trees (Number) | Standing trees Infected (Number) | Standing trees Infected (Percent) | Other trees possibly infected (Number) | Trees pulled or missing */ (Number) | Healthy trees (Number) | Increase 1940 to 1941: Infected plus pulled trees (Number) | Increase 1940 to 1941: Probable increase in infection (Percent) |
|---|---|---|---|---|---|---|---|---|
| 1940 | 1476 | 316 | 21.4 | 8 | 22 | 1152 | -- | -- |
| 1941 | -- | 393 | 28.6 | 3 | 126 | 976 | 181 | 57.3 |

*/ The trees were removed, according to the owner, because of their diseased condition, undoubtedly due to X-disease.

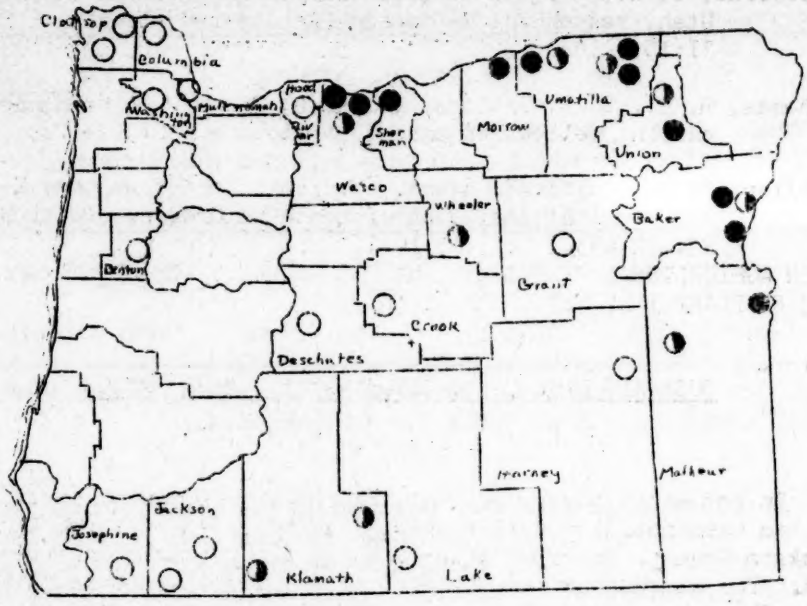
a golden yellow coloration was observed in two locations of eastern Baker County and in Malheur County in 1940. By July 1941 most of these trees had been removed. We first thought these trees infected with X-disease to have been also affected by alkaline soils but later realized the symptoms were similar to those described by Reeves and Hutchins (2) as "Group 2", and by Richards and Hutchins (3).

Typical western X-disease as observed in Wasco County, and which seemingly has two components (5), was observed in peach trees in Baker, Malheur, Sherman, Umatilla, and Wasco Counties in 1940. Union and Morrow Counties were added to the list in 1941. The accompanying map (figure 1) indicates the known present distribution of the disease in Oregon on peach and chokecherry; also the distribution of chokecherry in counties where X-disease has not yet been found.

Chokecherries with red leaf symptoms were usually found in districts where the disease of peach exists. However, some of the most severe cases in peaches were several miles from known chokecherries. In Union County in 1941, both red and yellowish symptoms were discovered in chokecherry. In Baker County the leaves of some chokecherries that showed yellowish symptoms in 1940 were red in 1941.

The spread of the X-disease of peach from 1940 to 1941 was followed in Baker, Malheur, and Umatilla Counties as well as in Wasco County. The rate of spread seemed about the same in all cases.

Our observations indicate that very young peach orchards are not infected even in the neighborhood of or adjoining older infected blocks. Many such instances have been found in Oregon. This would indicate that perhaps the X-disease has not been disseminated through nursery stock. The fact that young trees usually have not shown infection may be related, however, to some factor such as incidence of original infection within an infection area, and there is also the possibility that under natural conditions the incubation period may be of long duration. At any rate this condition should not be interpreted as indicating that young trees are not susceptible.




● Peach infected with X-disease
◑ Infected chokecherry
○ Healthy chokecherry in counties where X-disease has not been found.

Figure 1.--Distribution of X-disease in Oregon.

Buckskin disease of sweet cherries has not been surely diagnosed in Oregon [but see article by Zeller and Cordy following]. Fruit symptoms of the Napoleon variety similar to those described for buckskin are not accompanied by tree and leaf symptoms in Wasco County. This condition in that locality may be due to drouth rather than to the buckskin disease.

Varieties of peach found naturally infected with the western X-disease in Oregon are: Alta Loma (a selection of J. H. Hale); Crawford; both Early and Late; Elberta; Golden Jubilee; J. H. Hale; Improved Elberta; Lemon Cling; Muir; Orange Cling; Orange Seedling; Rio Oso Gem; Rochester; Salwey; South Haven, Slappey; Waldo; and Weber's Special (a local variety).

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(OREGON AGRICULTURAL EXPERIMENT STATION AND U.S. DEPARTMENT OF AGRICULTURE, BUREAU OF PLANT INDUSTRY COOPERATING.)

## BUCKSKIN DISEASE OF CHERRY IN SOUTHERN OREGON

S. M. Zeller and C. B. Cordy

In the early summer of 1940 a peculiar disease of sweet cherries which had been noticed in 1939 reappeared on 4 trees in the Ashland district of Jackson County, Oregon. Napoleon (Royal Anne) and Bing trees were affected. The disease starts in one branch and spreads through the affected trees. The fruit turns white at about half maturity and does not ripen. The leaves become yellow along the main veins, especially from the base upward, and some of the veins turn pinkish on the under surface. Early in the summer of 1941 several additional trees were infected in the same orchard, and one tree near Talent and one east of Medford showed symptoms similar to those at Ashland.

There is considerable bronzing of the leaves in mid-summer, and the internodes are shorter than normal resulting in a rosetted appearance especiallyat the ends of the branches. In the fall infected trees may send out compact tufts of small leaves from the terminal buds while the terminal buds of healthy trees appear dormant. Severely affected branches may die and sometimes the entire tree dies.

This condition is similar to the Napa Valley type of the buckskin disease described by Rawlins and Thomas.[1/] Bark samples from the infected trees at Ashland have given phloroglucin tests for buckskin. Such tests have been verified by Dr. Thomas.

No peach trees infected with the western X-disease have been found in Jackson County.

(OREGON AGRICULTURAL EXPERIMENT STATION AND EXTENSION SERVICE).

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1/ Rawlins, T. E., and H. Earl Thomas. The buckskin disease of cherry and other stone fruits. Phytopath. 31:916-925. 1941.

# CHARCOAL ROT ON POTATOES IN ILLINOIS

G. H. Boewe

On July 1, 1941, charcoal rot, caused by Rhizoctonia bataticola (Taub.) Butl., was discovered on potato plants in the truck garden area near East St. Louis, Illinois. This is the first record of this disease on this host in this State.

All of the potato fields examined in this region, both in the American Bottoms of Madison County and on the rolling upland soil of Monroe County, were found to have affected plants. Charcoal rot was observed also in LaSalle County, but was not found in 2 potato plantings examined in Calhoun and Cass Counties, the former on upland loess soil, the latter on Illinois River bottom soil. In diseased fields in which counts were made, an average of 19.7% of the hills were attacked. Diseased hills per field ranged from a trace in 2 plantings examined in LaSalle County to 48.8% in 1 field in Monroe County. In most cases every stem of the hill was attacked, although in a few instances 1 or 2, very rarely 3, stems appeared to be healthy.

In Madison County the prevalence of diseased hills varied greatly in different fields, ranging from 6.3 to 31.0%. Approximately 11% of the hills in all fields examined in this county were found to be diseased. In Monroe County the range of infection was small. In the 2 fields examined, 47.0 and 48.8% of the hills were found attacked. However, a wide variation in the number of diseased hills existed in the second of these fields, an average of 61.3% of the hills being diseased in the portion of the field not covered with straw and an average of 36.3% in the strawed portion. In one set of 100 consecutive hills in the unstrawed area, 88 diseased hills were found, and in another set of 100 consecutive hills in the strawed area, 45 diseased hills were found.

Infection appeared either to have occurred at different dates in different fields or to have progressed more rapidly in some fields than in others. In one field in Madison County, nearly all the affected plants were dead, and appeared to have been dead for a long time, when the field was examined on July 1. In another field in the same county, examined on the same day, only a part of the affected plants were dead, and the dead plants appeared not to have been dead for long. Hills prematurely killed by the disease produced a low yield of small tubers.

The size of the sclerotia found on potato stems ranged from 43.2 to 83 mu in width and from 49.8 to 106.2 mu in length. The average size of 100 sclerotia was 66.1 x 77.4 mu, which is well below the maximum mean of 120 mu permitted for inclusion in Haigh's (5) C grouping. Pure cultures from potato stems were grown on potato dextrose agar, and were transferred to Petri plates containing germinated corn and soybean seeds. Under these conditions the fungus readily attacked both kinds of seedlings and killed them.

Although this is the first record of charcoal rot on potatoes in Illinois, it is not the first report of its occurrence on this host. A brief review of the literature shows that charcoal rot has occurred on potato elsewhere in the United States as well as in other parts of the

world. In 1927 Boyd (2) reported a severe tuber, stem and root rot of potatoes in Georgia. He attributed the rot to a Macrophoma that was very common that year on snap beans in the southern part of the State. Also, in 1942 Bratley and Wiant (3) reported isolating Rhizoctonia batatícola (Taub.) Butl. from a few California potato tubers received on the Buffalo market in mid-July, 1941.

In addition to these records from the United States, charcoal rot has been reported in association with tuber rot, wilt or blight of potatoes in Morocco (1), India (4,6), Cyprus (7), Palestine (8), Greece (9), Uganda (10) and Bombay (11). I am indebted to the Division of Mycology and Disease Survey, U. S. Bureau of Plant Industry, for most of the literature references to this disease on potato and am appending them for the convenience of other workers.

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(SECTION OF APPLIED BOTANY AND PLANT PATHOLOGY, ILLINOIS NATURAL HISTORY SURVEY, URBANA, ILLINOIS).

# COTTON RUST IN ARIZONA

John T. Presley

Attacks of cotton rust occurred over a large area of Arizona in 1941. The fungus was observed doing serious damage in the Continental and Sahuarita districts south of Tucson; in the Eloy district east of Casa Grande, and in Hidden Valley, southwest of Casa Grande. The increased damage caused by the disease was undoubtedly due to the unusually favorable weather conditions for dissemination of the disease during 1941 and to the increased acreage of cotton on desert land.

Recent investigations at the U. S. Field Station, Sacaton, Arizona, have shown that the Bouteloua grasses, variously known as "six-weeks grama," "needle grama" and "rothrock grama," are alternate hosts of the cotton rust fungus.1/ These grasses are native to the Southwest and can be expected to grow abundantly on most desert lands when water is supplied, either by irrigation or by natural rainfall. Under natural conditions the grass springs up, grows and dies within a relatively short period as indicated by the name "six-weeks grama." On ditch banks and in cotton fields where moisture is available over longer periods the grass will grow for most of the summer and reach a size many times that of desert grown specimens. It is on this grass, in and immediately surrounding the cotton field, that the greater amount of rust inoculum is built up. As soon as a rainy period occurs the telia on the rusted grass germinate and the cotton becomes infected.

It is true that the grass becomes rusted at some distance from a cotton field, but the amount of rust is always greater on the grass growing in or near a field of cotton. Since the fungus cannot spread from cotton to cotton, it seems obvious that removal of the grass would eliminate a large amount of infectious material.

Grass that is growing in a cotton field may become infected early in the summer and reinfect the same cotton field later during the same growing season if weather conditions are favorable. This condition is possible because the telia which form on the grass soon after infection, are immediately viable and will germinate within 48 hours under suitable conditions. Cotton seedlings growing in the greenhouse became rusted within a week following inoculation with telial material from live grass.

## Possibilities for Control

The recent completion of life history studies for this rust forms a basis for postulating the following suggestions that should prove helpful in controlling serious outbreaks.

If the dead grass in and around a cotton field is rusted, it should be destroyed, by burning where possible, before the summer rains set in. The rust is easily recognized, and by examining bunches of grass at various places over the field a grower is able to estimate the amount of clean-up work he needs to do. The leaves and stems of the grass, if rusted, will have brownish or black protuberances which are pustules of rust spores.

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1/ Presley, John T. *Aecidium gossypii*, the aecial stage of *Puccinia boutelouae*. Phytopath. 32:97-99. Jan. 1942.

When badly rusted the grass is thickly covered by these spots, but by close inspection even light infection is recognizable. Clean cultural practices, including the ditch banks and fence rows, following removal or burning of the dead grass should insure against building up the rust inoculum in the field, and at the same time prove effective in reducing populations of harmful grasshoppers and various hemipterous insects.

There are several fungicides that kill the sporidia of the rust if applied at the right time and in sufficient quantity, but their application would be costly and it would be very difficult to make timely applications. It is only after rains and during periods of high relative humidity that the sporidia are released. A large part of the fungicide that might be applied previous to the rain would be washed off and infection likely would take place before extensive applications of additional dust or spray could be made.

(DIVISION OF COTTON AND OTHER FIBER CROPS AND DISEASES).

## RELATIVE PREVALENCE AND GEOGRAPHIC DISTRIBUTION OF VARIOUS EAR ROT FUNGI IN THE 1941 CORN CROP[1]

P. E. Hoppe[2]

This is a report of the ninth of a series of annual surveys, begun in 1932, of the relative prevalence and geographic distribution of ear rot fungi in the United States corn crop as indicated by platings of that portion of the crop reaching terminal markets. The results of the previous surveys have been reported annually (PDR 18:186-189, 20:26-30, 20:312-316, 21:222-224, 22:234-241, 23:142-148, 24:210-213, and 25:148-152). These surveys have been made possible through the active cooperation of the Grain and Seed Division, Agricultural Marketing Service, and grain inspectors licensed under the United States Grain Standards Act. Samples containing the sound and the commercially damaged kernel separates from samples of carload lots of corn of known origin are sent to the Chicago office of the Grain and Seed Division, Agricultural Marketing Service, for review, after which they are sent to the writer. The kernels in the damaged separates then are plated to identify the fungi associated with the damaged kernels. The kernels are first surface-sterilized by immersion for 10 to 12 minutes in a 10% solution of the commercial product "B.K." (3.5% sodium hypochlorite) after which they are plated on slightly acidified potato dextrose agar, incubated for 4 days at room temperatures, and then the organisms are identified.

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1/ Survey conducted by the Grain and Seed Division, Agricultural Marketing Service, U. S. Department of Agriculture, the Wisconsin Agricultural Experiment Station, and the Division of Cereal Crops and Diseases, Bureau of Plant Industry, U. S. Department of Agriculture, cooperating.

2/ Associate Pathologist, Division of Cereal Crops and Diseases, Bureau of Plant Industry, U. S. Department of Agriculture.

Table 1. Average percentages, by States and regions, of fungi recovered in plating damaged kernels from samples obtained from carload lots of corn arriving at terminal markets (1941 crop).

| Origin of samples | No. carloads sampled | Total damaged kernels | Sound kernels | Diplodia 1/ | Gibberella zeae | Fusarium moniliforme | Other fusaria | Nigrospora sphaerica | Mucors | Penicillium spp. | Aspergillus spp. | Sterile kernels | Miscellaneous | Unidentified 2/ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Atlantic Seaboard States: | | | | | | | | | | | | | | |
| Md. | 12 | 2.8 | 1.4 | 29.7 | 2.0 | 32.8 | - | 0.3 | 7.3 | 11.8 | - | 2.8 | 11.9 | - |
| Southern States: | | | | | | | | | | | | | | |
| Ky. | 3 | 4.5 | - | 59.2 | - | 33.3 | - | - | 3.1 | 2.0 | 0.9 | 0.7 | 0.8 | - |
| Tenn. | 36 | 4.6 | 0.8 | 50.1 | 0.2 | 39.5 | 0.2 | - | 2.3 | 0.9 | 0.7 | 0.2 | 4.9 | 0.2 |
| Ala. | 2 | 5.5 | - | 49.0 | - | 36.7 | 1.1 | - | - | - | - | - | 8.0 | 5.2 |
| Miss. | 3 | 5.3 | - | 63.3 | - | 27.7 | - | - | 2.5 | - | 1.7 | 2.0 | 2.8 | - |
| Average: | 44 | 4.7 | 0.6 | 51.6- | 0.1 | 33.3 | 0.2 | - | 2.3 | 0.8 | 0.8 | 0.3 | 4.6- | 0.4 |
| East-Central States: | | | | | | | | | | | | | | |
| Ohio | 10 | 3.8 | 0.8 | 45.6 | 0.7 | 7.8 | - | 0.5 | 9.4 | 9.0 | - | 6.7 | 19.5 | - |
| Ind. | 11 | 4.6 | 0.3 | 49.1 | 2.2 | 22.6 | 0.4 | 0.2 | 3.9 | 12.2 | 1.2 | 0.7 | 7.2 | - |
| Ill. | 154 | 4.6 | 0.4 | 69.3 | 2.8 | 11.0 | 0.1 | 0.1 | 3.6 | 4.0 | 0.9 | 0.8 | 6.9 | 0.1 |
| Average: | 175 | 4.5 | 0.4 | 66.7 | 2.7 | 11.5 | 0.1 | 0.1 | 4.0 | 4.8 | 0.9- | 1.1 | 7.6+ | 0.1- |
| West-Central States: | | | | | | | | | | | | | | |
| Minn. | 14 | 5.0 | 0.7 | 14.6 | 9.3 | 13.0 | 1.1 | 2.2 | 6.1 | 18.3 | 0.5 | 8.6 | 25.6 | - |
| Iowa | 35 | 3.6 | 0.3 | 66.8 | 4.5 | 12.6 | 0.7 | 0.8 | 3.0 | 2.1 | 0.1 | 1.6 | 7.4 | 0.1 |
| Mo. | 15 | 6.0 | 2.2 | 37.1 | - | 34.4 | - | 0.3 | 10.5 | 1.5 | 2.1 | 1.4 | 10.5 | - |
| Average: | 64 | 4.5 | 0.8 | 48.4+ | 4.4 | 17.8 | 0.6+ | 1.0- | 5.5 | 5.5 | 0.7 | 3.1 | 12.1 | 0.1- |
| Western States: | | | | | | | | | | | | | | |
| Nebr. | 4 | 5.0 | - | 22.9 | - | 49.0 | 1.0 | - | 12.7 | 5.6 | 0.7 | 2.4 | 5.7 | - |
| Kans. | 1 | 3.1 | - | - | - | 42.4 | - | - | 12.1 | - | - | 24.3 | 21.2 | - |
| Average: | 5 | 4.6 | - | 18.4 | - | 47.7 | 0.8 | - | 12.6 | 4.5- | 0.5 | 6.7 | 8.8 | - |
| Southwestern Region: | | | | | | | | | | | | | | |
| Texas | 32 | 8.1 | 3.4 | 21.4 | - | 30.5 | 0.2 | - | 4.8 | 1.8 | 19.9 | 2.9 | 15.1 | - |

1/ *Diplodia zeae* in all regions except Southern States. Here both *D. zeae* and *D. macrospora* occurred and their totals are combined.

2/ A fungus frequently found in eastern samples and occasionally in those from elsewhere. Its pathogenicity as a stalk and ear rot fungus has been demonstrated by the writer in artificial inoculation experiments.

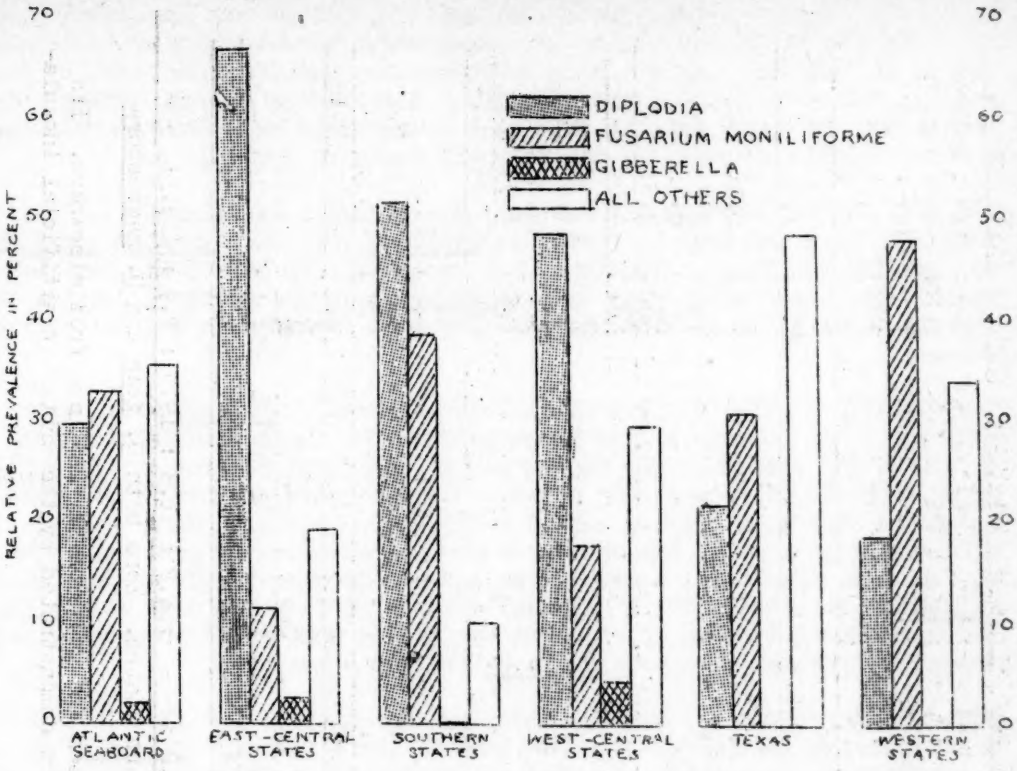


Figure 1. -- Relative prevalence of Diplodia (D. zeae and D. macrospora), Gibberella zeae, Fusarium moniliforme, and a group which includes all other fungi, bacteria, sterile kernels, etc. in the 1941 corn crop for 6 general geographic regions, as indicated by platings of the damaged kernels in samples obtained from carload lots of corn arriving at terminal markets from the regions indicated. (From data in table 1).

## Results of 1941 Survey

A total of 332 samples of the 1941 crop were plated. Approximately 300 of these represented November and December shipments and the remainder were from January receipts. Nearly one-half (155) of the samples were from Illinois, a region in which ear rots appear to have been more prevalent in 1941 than in the other Corn Belt States. The results of the 1941 survey are tabulated for States and geographic regions in table 1, and are presented graphically in figure 1. A brief discussion of them follows:

ATLANTIC SEABOARD (Maryland). The results obtained this year differed from those obtained heretofore. The principal differences were an extremely low incidence of Gibberella zeae (only 2%) and a complete absence of an uniden-

tified fungus heretofore always found in Eastern samples. In addition the "total damaged kernels"3/ in the samples obtained was abnormally low for this region and difficulty was experienced in obtaining a sufficient number of samples. The evidence indicates an unusually low level of ear rots in the field in this area in 1941. A period of drought during late summer and the early fall in this area undoubtedly explains the "abnormal" plating results in 1941 for the Atlantic Seaboard region.

SOUTHERN STATES (Kentucky, Tennessee, Mississippi, and Alabama). Platings from this area ran true to form with Diplodia spp. and Fusarium moniliforme the leading rot fungi. Together they accounted for 90% of the damaged grain. The ratio of D. zeae to D. macrospora in the southern samples was approximately 19 to 1. This agrees with data obtained in the former surveys.

EAST-CENTRAL STATES (Ohio, Indiana, and Illinois). Diplodia was overwhelmingly the leading fungus isolated from the samples originating in this area and accounted for two-thirds of the damaged kernels. F. moniliforme, with 11.5%, was a poor second. As mentioned previously ear rots appear to have been very prevalent in Illinois in 1941. Many samples originating in some of the best corn growing counties in this State ran as high as 6 to 10% "total damaged kernels" and frequently 90% or more plated Diplodia. Evidence such as this indicates that there is room for considerable improvement in some of the corn hybrids in commercial production with respect to resistance to the Diplodia ear rot disease.

WEST-CENTRAL STATES (Minnesota, Iowa, and Missouri). The data in table 1 show different plating results for each of these States. Diplodia and F. moniliforme were about of equal importance in the Missouri samples and together accounted for approximately 70% of the damaged kernels. The Iowa results were much like those from Illinois with Diplodia easily the leading fungus. Diplodia was plated from nearly 70% of the kernels in the Iowa samples. Damage in the Minnesota samples was distributed, largely, in order of importance, between storage rot fungi, Diplodia, F. moniliforme, and Gibberella. The incidence of Gibberella was 9.3%. Evidence that the Gibberella area in 1941 extended into Iowa is shown from a study of the distribution of Gibberella in this State. Five samples were received from counties in northern Iowa and these averaged 17.9% Gibberella as compared with an average of only 3.3% for the remaining 30 samples originating elsewhere in the State.

SOUTHWEST (Texas). With one exception the Texas samples came from a region generally southeast of the central portion of the State, centering around Guadalupe and McLennan Counties. The damage in the Texas samples differed distinctly from that in the Corn Belt samples in that much of it was not caused primarily by fungi but rather by weevils and possibly other insects. Texas samples in the past always have been characterized by high percentages of Aspergillus spp. 1941 was no exception and nearly 20% of the damaged kernels plated Aspergillus. Among the better recognized ear rot fungi Diplodia and F. moniliforme were most prevalent and between them accounted

3/ "Total damaged kernels as defined in the Official Grain Standards for corn are kernels and pieces of kernels of corn which are heat damaged, sprouted, frosted, badly ground damaged, badly weather damaged, or otherwise materially damaged."

for slightly over 50% of the damaged grain. No cultures of D. macrospora were observed in the Texas platings.

WESTERN STATES (Kansas and Nebraska). Only 5 samples were obtained from this area in which F. moniliforme always has been the predominant ear rot fungus. The 1941 samples averaged 47.7% for Fusarium and 18.4% for Diplodia. This is somewhat lower for Fusarium and slightly higher for Diplodia than normally is expected in the Western States.

## RICE BLAST IN ARKANSAS

E. M. Cralley and C. R. Adair

Blast or rotten-neck (Piricularia oryzae Br. & Cav.) of rice (Oryza sativa L.) has been causing serious losses in Arkansas in new areas recently brought into rice production. The disease decreases in importance as the land is cropped to rice, and rarely causes severe injury after 3 or 4 crops have been grown on the land. Minor losses have been observed on old rice fields which previously had been out of rice production for a number of years.

Symptoms have been observed on various parts of the plants including leaves, leaf sheaths, and nodes; however, the most outstanding symptom is the blasted panicle resulting from infection of the neck region. Occasionally, plants growing on levees lodge as a result of infection of the lower nodes. This latter type of injury is sometimes erroneously diagnosed as stem rot (Leptosphaeria salvinii Catt.) by rice farmers.

Owing to the importance of rice blast in a number of new rice areas, outlying varietal tests were conducted in 1940 and 1941 to determine whether the common commercial varieties or hybrid selections differ in their reaction to this fungus. The varieties were grown in 3-rod row randomized plots. Four replications were used in 1940 and six in 1941. Notes were taken on the percentage of blasted panicles in the center row of each of the 3-rod row plots when the varieties reached maturity. The results are shown in the accompanying table.

The results show that there is a significant difference in the reaction of several of the varieties to blast. Early Prolific, a variety commonly grown on new land, is very susceptible while Zenith and Arkansas Fortuna, which normally outyield Early Prolific and command better prices, are resistant. The high-yielding hybrid selections, Arkrose and Prelude, appear to be moderately resistant to blast.

Reaction of Rice Varieties to Blast

| Variety | Infection | | |
|---|---|---|---|
| | Blackton, Ark. 1940 | Newport, Ark. 1940 | Brinkley, Ark. 1941 |
| | Mean percentage | Mean percentage | Mean percentage |
| Rexoro X Delitus, B321A2 | 0.0 | 0.0 | 0.7 |
| Rexoro X C. I. 5094, 3324A1 | 0.0 | 0.0 | ... |
| Shoemed | 0.3 | 0.0 | 0.0 |

| Variety | Infection | | |
|---|---|---|---|
| | Blackton, Ark. 1940 | Newport, Ark. 1940 | Brinkley, Ark. 1941 |
| | Mean percentage | Mean percentage | Mean percentage |
| Nira | 0.3 | 0.0 | 1.3 |
| Arkansas Fortuna | 0.4 | 0.4 | 0.1 |
| Zenith | 0.6 | 0.2 | 0.0 |
| Asahi | 1.3 | 0.1 | 1.2 |
| Edith | 2.4 | 3.1 | 0.5 |
| Lady Wright | 2.7 | 2.1 | 0.6 |
| Acadia | 2.7 | 0.2 | 1.6 |
| La. Blue Rose, C2854-3 | 3.6 | 0.0 | 1.1 |
| Colusa | 3.9 | 3.1 | ... |
| Kameji X Blue Rose, AH-29-153 | 4.9 | 1.7 | ... |
| Arkrose | 5.2 | 0.5 | 2.1 |
| Edith X Caloro, AH-29-3-1 | 5.7 | 4.0 | ... |
| Prelude | 6.0 | 0.5 | 1.1 |
| Caloro | 8.6 | 1.5 | 3.8 |
| Supreme Blue Rose | 9.7 | 0.1 | 0.8 |
| Old Style Blue Rose | 12.9 | 0.8 | 3.5 |
| Early Prolific | 23.6 | 9.5 | 8.9 |
| Imp. Blue Rose X Fortuna, C2920A41 | ... | ... | 0.0 |
| Stephen's selection | ... | ... | 0.0 |
| Edith X Fortuna, C283A9 | ... | ... | 0.1 |
| Kameji X Blue Rose, B2912A13 | ... | ... | 0.5 |
| Kameji X Blue Rose, AH-29-128 | ... | ... | 0.9 |
| Kameji X Blue Rose, B2912A47 | ... | ... | 0.9 |
| Nakata Shinriki | ... | ... | 2.7 |
| Forest Rose | ... | ... | 10.5 |
| Colusa X Blue Rose, B2913A29 | ... | ... | 11.7 |
| Difference required for significance -5%: | 2.93 | 2.42 | 2.93 |
| 1%: | 3.91 | 3.22 | 3.89 |

(COOPERATIVE INVESTIGATIONS, ARKANSAS AGRICULTURAL EXPERIMENT STATION AND DIVISION OF CEREAL CROPS AND DISEASES, U. S. BUREAU OF PLANT INDUSTRY).

## PLANT DISEASES IN MONTANA

PHOMA INFECTION OF SUGAR BEETS PLANTED IN THE FALL. — M. M. Afanasiev.

Sugar beets were planted in the fall of 1940 in the Gallatin Valley near Bozeman, Montana, to determine whether seeds could be raised satisfactorily.

The growth of beet plants in the fall was very good and at the time of approaching their dormancy period the roots were 1 to 1-1/2 inches in diameter.

The winter of 1940-41 was rather mild with only a little snow on the ground. During the early part of the spring of 1941 frequent freezings and thawings occurred with apparently an injurious effect on the sugar beets which were yellowish in color and low in vigor. When the fields were inspected in the latter part of the spring many of the beet roots were entirely or partly rotted. Representative samples were collected to determine the cause of the rot. Isolations were made on potato dextrose agar, and from nearly every beet a pure culture of Phoma betae (Oud.) Fr. was obtained. This organism is at the most a weak parasite, capable of causing root rot only after the normal resistance of the beet has been seriously impaired. These beets were grown under unfavorable climatic conditions, and no doubt their vigor was much reduced as the root rot was responsible for practically a total loss of the crop.

VIOLET ROOT ROT OF POTATOES AND SUGAR BEETS. -- H. E. Morris.

In 1941 one sample of Katahdin potatoes and one sample of sugar beets affected with a disease not heretofore listed in Montana were received by the Botany Department for identification. Both samples came from Cascade County, in the vicinity of Great Falls, Montana.

The disease was identified as violet root rot caused by Rhizoctonia crocorum (Pers.) DC.

The surface of the potato was more or less covered with a felt-like mass of the mycelium which was chocolate color when dry, and violet-brown when moist. The greater part of the mycelium mat could be removed. On the potato skin were present numerous small black dots, which under the microscope had the appearance of sclerolia. The entire surface of the Katahdin tubers were reddish in appearance in contrast to the normal cream-buff color.

No cultures were attempted.

The sugar beets showed the characteristic mycelium on the surface cracks, together with the minute sclerotia. There was also considerable rotting of the beet, apparently due to the fungus. The rot began at or near the crown and progressed downward, turning the attacked tissue brown to almost black in color. The disease was not widespread and in this particular case caused no economic loss.

No information concerning the extent of loss or conditions under which the disease was prevalent was obtained by further inquiry. This disease, although new to the State, is not considered serious at the present time.

SCLEROTINIA ON GREAT NORTHERN BEANS. -- H. E. Morris

A 20-acre field of Great Northern Beans in the Canyon Creek District west of Billings was inspected on account of a serious disease condition.

Many bean plants showed severe injury and an examination revealed many sclerotia in the pith of the stems. These were probably the sclerotia of Sclerotinia libertiana [S. sclerotiorum] which is parasitic on beans. No infection experiments were made. Specimens were submitted to the Bureau of Plant Industry, Washington, D. C. for identification.

It was estimated by the owner that the disease had reduced the yield 80%. Another nearby 10-acre field showed a 50% loss.

The grower stated that the disease had been present for several years and was generally distributed in a restricted area. The disease was more destructive during 1941 than in former years. (BOTANY AND BACTERIOLOGY DEPARTMENT, AGRICULTURAL EXPERIMENT STATION, MONTANA STATE COLLEGE, BOZEMAN).

## BRIEF NOTES ON PLANT DISEASES

DEVELOPMENT OF APPLE SCAB IN PENNSYLVANIA: The following is a summary of the examination of apple scab perithecia made this spring in Pennsylvania by G. L. Zundel, A. H. Bauer, O. S. Cannon, and myself. In February one examination of 100 perithecia showed no differentiation. In the first half of March 120 perithecia were examined from 2 collections. These showed no differentiation. Of 304 perithecia examined from 5 collections of leaves, March 16 to 25, 63% were undifferentiated, 29.7% showed asci with no spores, 7% had asci with colorless spores, and 1.3% had asci with some colored spores. All these collections were made from unsprayed or partly sprayed orchards and it appears to us that the scab fungus [Venturia inaequalis] is developing more slowly than usual, because of the extremely dry weather last fall during the latter part of August and September. (R. S. Kirby, Extension Plant Pathologist, March 31.)

MATURATION OF PERITHECIA OF THE APPLE SCAB FUNGUS IN MISSOURI, 1942: Several collections of scabbed Rome Beauty apple leaves were examined at Columbia, Missouri on February 12. Perithecia were found in 67% of the leaves examined but less than 1% contained mature ascospores. A collection of scabbed Red Delicious apple leaves was examined on February 28. Perithecia were numerous and counts showed 23% contained mature ascospores. (M. A. Smith, Division Fruit and Vegetable Crops and Diseases, Bureau of Plant Industry).

A NEW FUNGUS ON BERMUDA GRASS IN LOUISIANA: A clump of Bermuda grass (Cynodon dactylon (L.) Pers.) was found early in February at Baton Rouge, Louisiana, infected with a Phyllachora which was identified as Phyllachora cynodontis Niessl by Dr. C. R. Orton at West Virginia University. The stromata of the fungus were found in great numbers on all the leaves of the prostrate culms leading out from one clump. This clump was growing among some trees and shrubbery in a rather protected spot on the campus of the Louisiana State University. Only a single infected plant was found.

According to Dr. Orton, this is the first record of this fungus from continental North America. (George Nyland, Department of Botany, Louisiana State University).

"MEETING THE SPRAY MATERIAL SHORTAGE" is the title of Connecticut Agricultural Experiment Station Bulletin 455 (March 1942), by Neely Turner and James G. Horsfall. Besides accurate diagnosis of diseases and careful selection of crops to be protected, emphasis is on the practicability of

the conservation of materials by reducing the dosage, and on the prevention of waste by improving the efficiency of application, by timing treatments according to weather, and by timing planting of crops to escape pests.

The authors' emphatic statement, regarding the application of dusts when dew is on the plants, "This fact has been known for at least 100 years and it is high time to apply it" (p. 177, authors' italics), is pertinent to many other plant disease situations.

## THE USE OF DINITRO-ORTHO-CRESOL AS AN ERADICANT SPRAY FOR FRUIT DISEASES[1]

E. G. Sharvelle

The control of plant diseases by the application of chemical sprays has been based, until comparatively recently, on the assumption that certain chemicals toxic to plant pathogenic fungi serve as protective agents in preventing the development of plant pathogens when applied prior to inoculation. Most of the chemical sprays now in use are of the protective type, must be applied in advance of infection, and must be maintained by repeated applications as a completely protective coating. The inadequacy of such methods, requiring repeated and costly spraying accurately timed to coincide with potential periods of infection, has been apparent for some time.

Cordley[2], in 1908, introduced lime sulfur as a dormant spray for the control of apple scab. Since that time lime sulfur has been widely used in most states for the control of fruit diseases. Lime sulfur in the polysulfide form functions essentially as an eradicant spray for the elimination of primary inoculum before its liberation. Lime sulfur when applied as a spray will form a residue on the plant parts to which it is applied, and the polysulfide sulfur in this deposit will ultimately be converted wholly or in part to elemental sulfur. In this form lime sulfur functions as a protective spray, and has been used as a summer spray for the control of such diseases as apple scab and brown rot of stone fruits. The phytocidal properties of lime necessitate caution in its use, and in some instances it has not proven entirely satisfactory as a summer spray. Keitt and Palmiter[3] advocated the use of "complementary procedures based on the principles of immunization and eradication in addition to protection" in combating fruit diseases. They reported that suitable mixtures of copper, lime, and arsenic have eradicant properties because their fungicidal action is effective at considerable distances from the undissolved residue. Such mixtures were also found to be highly effective for the inactivation of fungal fruiting structures on the surface of invaded tissues. Several pathogenic fungi, including Venturia pyrina, Coccomyces hiemalis,

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1/ Paper No. 1988, Scientific Jour. Series, Minnesota Agricultural Experiment Station.

2/ Cordley, A. B. The lime-sulfur spray as a preventative of apple scab. Rural New Yorker 67:202. 1908.

3/ Keitt, G. W. and Palmiter, D. H. Potentialities of eradicant fungicides for combating apple scab and several other plant diseases. Jour. Agr. Res. 55 (6). 397-438. 1937.

Dibotryon morbosum, Mycosphaerella rubina, and Sclerotinia [Monilinia] fructicola, were inactivated by eradicant fungicides composed of appropriate mixtures of copper sulfate, milk of lime, calcium arsenite, and zinc arsenite.

In 1939 a coordinated project was undertaken by workers at several experiment stations to investigate the value of the sodium salt of dinitro-ortho-cresylate (Elgetol) as an eradicant spray for the control of apple scab. The results obtained in Minnesota are recorded in this paper.

## Methods

Apple scab control. In the spring of 1940 an isolated ten-acre block of McIntosh apples was selected from an orchard of 126 acres for "ground spray" experiments with dinitro cresol. The rows selected for the treatment were located at the northern edge of the orchard to reduce the likelihood of infection by wind-blown spores from other sources; there were no orchards for several miles northward from the experimental block. The orchard rows which were not sprayed with dinitro cresol were situated immediately to the south of the above rows. A ground spray of 0.5% Elgetol was applied on April 30, 1940, to the experimental block, at the rate of 500 gallons to the acre, using a 350-gallon Friend sprayer with 2 lines of hose. Care was taken to spray the ground immediately beneath the trees very thoroughly by applying the eradicant material from both sides of the tree, along the rows and across the orchard. The entire orchard later was sprayed 5 times with lime-sulfur, the first application being made on May 9, and the last August 9.

In 1941 the same orchard was used for the experiment, the same ground area being sprayed with Elgetol as in the previous season but the summer spray used was Stauffer Magnetic "70" sulfur paste instead of lime sulfur, 5 applications being made as in the previous season. In 1941 a 7-acre block of the variety Cortland, just coming into full bearing, which had not been thoroughly sprayed during previous seasons, was also used for Elgetol experiments. Part of this orchard was treated with 0.5% Elgetol, and all of it was then sprayed during the summer with Stauffer Magnetic "70" sulfur paste, using a schedule identical with that employed for the McIntosh block on the same property. All were kept under observation during the summers, but scab developed on the foliage too late in both seasons to permit the recording of accurate data on foliage infection. At harvest time, which occurred on September 24 in 1940, and on September 11 in 1941, samples of apples were taken from trees at random throughout the experimental plots. The samples from each plot were then graded (by hand) for scab infection, the percentage of fruit infected and the severity of scab being recorded. Each scab-infected fruit was given an arbitrary disease rating similar to that used in cereal rust studies. A rating of "0" indicated no scab infection, a rating of "1" being given to fruit with 1-2 scab lesions, "2" for fruit with 3-5 scab spots, "3" for 6-9 lesions, and a rating of "4" for fruit with 10 or more scab lesions. The averages of these disease ratings were used as the criterion for scab severity in each plot.

## Results

The results are given in Table 1. During 1940 a striking reduction in the amount of scabby fruit resulted when 0.5% Elgetol was used as a ground spray in addition to the regular lime sulfur schedule. In addition to a reduction of 16% in the amount of scabby fruit, the severity of infection also was noticeably decreased. The arbitrary disease rating of 1.21 for the fruit from the block receiving the Elgetol treatment indicates that each infected fruit had an average of less than 2 scab lesions. On

Table 1. Effect of ground sprays of 0.5% Elgetol on the development of apple scab.

| Year | Variety | Treatment | Total No. apples examined | Total No. scab-infected apples | Percentage scab | Average disease rating |
|---|---|---|---|---|---|---|
| 1940 | McIntosh | Reg. Schedule | 1000 | 205 | 20.5 | 2.44 |
| | McIntosh | Reg. Schedule plus Elgetol | 1000 | 41 | 4.1 | 1.21 |
| 1941 | McIntosh | Reg. Schedule | 580 | 35 | 6.0 | 1.80 |
| | McIntosh | Reg. Schedule plus Elgetol | 510 | 21 | 4.1 | 1.90 |
| | Cortland | Reg. Schedule | 393 | 218 | 56.6 | 1.85 |
| | Cortland | Reg. Schedule plus Elgetol | 194 | 54 | 27.6 | 1.51 |

the other hand, the disease rating of 2.44 for infected fruit from the plot that did not receive Elgetol indicates that each infected fruit had an average of more than 5 lesions. If a cull apple, from the standpoint of scab, were to be defined as any fruit having 5 or more scab lesions, of the 20.5% infected apples from the plot not receiving Elgetol, 9.9% could be designated as culls. Of the 4.1% infected fruit from the plot receiving the ground spray only 0.5% could be designated as culls. This reduction in severity of scab infection would result in a large increase in the amount of marketable fruit.

In 1941 the use of Elgetol on the same trees as those in the experiment of the previous year did not result in a marked decrease in scab infection when compared with trees not receiving the treatment. However, the percentage of scabby fruit in both sections of the plot was considerably reduced when compared with the previous season. This cannot be explained on the basis of a light scab year, as the variety Cortland in other orchards in the same region was heavily infected in 1941. Neither can it be attributed to the increased efficiency of Stauffer Magnetic "70" sulfur paste as a protective spray, for Cortland apples sprayed with this material were severely infected in 1941. It would appear from these results that Elgetol has a carry-over effect from the previous season's application.

In the Cortland orchard, which was heavily infected with scab, ground spraying with Elgetol again greatly reduced the percentage of scabby fruit, and also slightly reduced the severity of the disease.

## Control of Raspberry Anthracnose

Anthracnose (Elsinoë veneta) of red raspberries has become a problem of sufficient importance in Minnesota during recent years to justify investigations on methods of control. In the course of routine experiments on its control in 1940, 0.5% Elgetol was used as a delayed dormant spray. The results are given in table 2. The delayed dormant applications were applied to the canes during the "green tip stage", just as the buds were beginning to burst, and the cover sprays were applied one month later when the leaves were fully expanded. At harvest time each hill in the various plots was inspected individually, being considered as infected if any of the canes within the hill were diseased. The severity of the disease within each hill was designated by an arbitrary disease

Table 2. Control of raspberry anthracnose.

| Location | Treatment | Time of application | Av. length of canes (ins.) 1/ | Percentage hills infected 1/ | Average infection type 1/ |
|---|---|---|---|---|---|
| Duluth First Location | Unsprayed | ---- | 42.2 | 99.7 | 2.8 |
| | 1/2% Elgetol | Delayed dormant | 39.2 | 80.6 | 1.1 |
| | 1/2% Elgetol 4-4-50 Bordo | Delayed dormant Cover spray | 39.9 | 77.7 | 1.3 |
| | 1/2% Elgetol Copper Compound "A" | Delayed dormant Cover spray | 43.8 | 88.8 | 1.8 |
| | 3-50 lime sulfur 4-4-50 Bordo | Delayed dormant Cover spray | 42.7 | 30.5 | 0.4 |
| Duluth Northeast experiment station | Unsprayed | ----- | ---- | 98.8 | 2.6 |
| | 1/2% Elgetol | Delayed dormant | ---- | 46.6 | 0.9 |
| | 3-50 lime sulfur Copper Compound "A" | Delayed dormant Cover spray | ---- | 21.4 | 0.4 |
| | 3-50 lime sulfur 4-4-50 Bordo | Delayed dormant Cover spray | ---- | 12.2 | 0.2 |

1/ Results represent the average of 50 observations on separate hills within the individual spray plots.

rating similar to that described for the apple scab work. At the first location a single application of 0.5% Elgetol reduced the percentage of infected hills to some extent, and greatly reduced the severity of the disease. The addition of a cover spray of 4-4-50 bordeaux mixture further increased the degree of control, but neither of these treatments were as efficient as a delayed dormant application of 3-50 liquid lime sulfur followed by a cover spray of 4-4-50 bordeaux mixture. At the second location slightly better control was obtained with a delayed dormant application of Elgetol, the percentage of infection being reduced to less than half that of the unsprayed plot. The severity of infection was again greatly reduced by this treatment. The lime sulfur-bordeaux combination again proved to be the most effective method of control. The results obtained in 1940 indicated that Elgetol used as a delayed dormant spray may have some value as a control for raspberry anthracnose. In 1941 the experiment was repeated using Elgetol at a strength of 0.75%, again applied as a delayed dormant spray. Detailed records were not kept of these experiments but observations indicated that Elgetol applied as a delayed dormant spray at this strength was equally as effective in controlling raspberry anthracnose as 3-50 liquid lime sulfur. Certain growers in Minnesota are considering Elgetol as a substitute for lime sulfur in their commercial spray program, as it would be somewhat cheaper and appears to cover more surface than equivalent amounts of lime sulfur, thereby requiring less material for the delayed dormant spray application. The use of Elgetol at a strength of 1% might be worthy of consideration as a dormant spray for the control of this disease.

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